

PATENT ABSTRACTS OF JAPAN

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(54) POLARIZING PLATE AND ITS MANUFACTURING METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a polarizing plate capable of displaying more neutral gray white and black with high contrast and further to provide a method for manufacturing the same.

SOLUTION: The polarizing plate comprising a polarizing film of which at least the one surface is laminated with a protective film through an adhesive layer, having $\geq 40\%$ single body transmittance, having a^* and b^* of perpendicular hue measured by JIS Z 8729 in $-5.0 \leq a^* \leq 10$ and $-10 \leq b^* \leq 1.0$ ranges respectively, having a^* and b^* of parallel hue in $-4.0 \leq a^* \leq 4.0$ and $-1.0 \leq b^* \leq 5.5$ ranges respectively and further having either of the layers comprising it having an absorption spectrum satisfying relations $0 \leq A/D \leq 0.3$, $0.1 \leq B/D \leq 0.7$, $0.5 \leq C/D \leq 1.4$ and $0 \leq E/D \leq 0.5$ where absorbance at 450 nm, 500 nm, 550 nm, 600 nm and 650 nm are denoted as A, B, C, D and E respectively and the method for manufacturing it are provided.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to a polarizing plate and its manufacture approach.

[0002]

[Description of the Prior Art] The polarization film with which adsorption orientation of the dichroism matter was carried out to the polyvinyl-alcohol-resin film is used as one of the members for liquid crystal displays with the gestalt of the polarizing plate with which the protection film was usually stuck at least on one side. However, when the conventional polarizing plate was used for the liquid crystal display, especially the reflective mold liquid crystal display, there was a problem that the white display of a liquid crystal display colored it yellow, and was in sight. Provisional Publication No. in order to solve this problem 62 No. -134625 official report and publication number 8-304624 It is reported to the number official report by by changing the configuration of the transparency spectrum of a polarizing plate that coloring of a white display of a liquid crystal display is suppressed.

[0003] However, the polarizing plate indicated by each above-mentioned official report has low degree of polarization as compared with the polarizing plate generally used, and the rectangular hue has shifted it in the blue direction. Therefore, in the liquid crystal display using such a polarizing plate, although surely the white display would be the so-called neutral gray, since degree of polarization was low, contrast fell, and the fault that a black display will color blue arose, and it was not completed. [of a skillful display] Moreover, colorization of various liquid crystal displays and the shift to a reflective mold are advancing by being at a quick pace, a white display and black display is also neutral gray, and development of the neutral gray polarizing plate which can display high contrast is called for in recent years.

[0004]

[Problem(s) to be Solved by the Invention] Then, this invention persons reached [that a problem is solvable and] the location of the arbitration of the existing polarizing plate at a header and this invention by arranging the coloring layer which has a specific absorption spectrum, as a result of inquiring wholeheartedly that a gray more neutrally white display and a black display are possible, and a polarizing plate with still higher contrast should be developed. Therefore, the purpose of this invention is for a gray more neutrally white display and a black display to be possible, offer a polarizing plate with still higher contrast, and offer the manufacture approach of a polarizing plate advantageous to a pan therefore.

[0005]

[Means for Solving the Problem] Namely, this invention is a polarizing plate with which it comes to carry out the laminating of the protection film to at least one side of a polarization film through a glue line. simple substance permeability is 40% or more -- JIS Z8729 a* and b* of a rectangular hue which are measured by being based -- each -- - 5.0 <=a*<=10 It reaches. It is in the range of -10 <=b*<=1.0. the same -- a* and b* of an parallel hue -- each and -4.0 <=a*<=4.0 and -- It is in the range of -1.0 <=b*<=5.5. One which constitutes this polarizing plate of layers the absorbance in the wavelength of

450nm And A, When an absorbance [in / for an absorbance / in / for an absorbance / in / for the absorbance in the wavelength of 500nm / B and the wavelength of 550nm / C and the wavelength of 600nm / D and the wavelength of 650nm] is set to E, The polarizing plate which has the absorption spectrum which fills all the relation between a bottom type (I) - (IV) is offered.

[0006]

$0 \leq A/D \leq 0.3$ (I)

$0.1 \leq B/D \leq 0.7$ (II)

$0.5 \leq C/D \leq 1.4$ (III)

$0 \leq E/D \leq 0.5$ (IV)

[0007] Moreover, according to this invention, the laminating of the protection film is carried out to at least one side of a polarization film through a glue line. In manufacturing a polarizing plate, one which constitutes this polarizing plate of layers When an absorbance [in / for an absorbance / in / for an absorbance / in / for the absorbance in the wavelength of 450nm / A and the wavelength of 500nm / B and the wavelength of 550nm / C and the wavelength of 600nm / D and the wavelength of 650nm] is set to E, The method of making the layer concerned contain a coloring agent and manufacturing a polarizing plate is also offered so that the absorption spectrum which fills all the relation between said formula (I) - (IV) may be shown.

[0008]

[Embodiment of the Invention] As for the polarizing plate of this invention, the laminating of the protection film is carried out to at least one side of a polarization film through a glue line. The polarization film which constitutes this polarizing plate is manufactured by usually carrying out adsorption orientation of iodine or dichroism coloring matter like dichromatic dye to the polyvinyl-alcohol-resin film by which uniaxial stretching was carried out.

[0009] The polyvinyl alcohol resin which constitutes a polarization film is obtained by saponifying polyvinyl acetate resin. As polyvinyl acetate resin, the copolymer of other monomers in which others, vinyl acetate and this, and copolymerization are possible etc. is illustrated, for example. [polyvinyl acetate / which is the homopolymer of vinyl acetate] As vinyl acetate and a monomer which can be copolymerized, unsaturated carboxylic acid, olefins, vinyl ether, and partial saturation sulfonic acids are mentioned, for example. whenever [in polyvinyl alcohol resin / saponification] -- usually -- 85-100-mol % -- it is the 98-100-mol range of % preferably. A polyvinyl formal, a polyvinyl acetal, etc. which this polyvinyl alcohol resin may denaturalize further, for example, denaturalized by aldehydes can be used. the polymerization degree of polyvinyl alcohol resin -- usually -- the range of 1,000-10,000 -- it is the range of 1,500-10,000 preferably.

[0010] While uniaxial stretching was carried out, after being dyed by dichroism coloring matter, boric-acid processing of this polyvinyl-alcohol-resin film is carried out. In order to carry out uniaxial stretching, between the rolls with which peripheral speed differs, you may extend on one shaft and may extend on one shaft using a hot calender roll. Moreover, you may be the dry type extension which extends in atmospheric air, and may be the wet extension which extends in the condition of having swollen with the solvent. Draw magnification is usually about 4 to 8 times. Such a polyvinyl-alcohol-resin film by which extension orientation was carried out is dyed by dichroism coloring matter.

[0011] What is necessary is just to immerse a polyvinyl-alcohol-resin film in the water solution containing iodine and potassium iodide, in using iodine as dichroism coloring matter. The contents of the iodine in this water solution are usually per [0.01] water 100 weight section - 0.5 weight sections extent, and the contents of potassium iodide are usually per [0.5] water 100 weight section - 10 weight sections extent. The temperature of this water solution is usually about 20-40 degrees C, and immersion time amount is usually about 30 - 300 seconds.

[0012] What is necessary is on the other hand, just to immerse a polyvinyl-alcohol-resin film in the water solution of dichromatic dye, in using dichromatic dye as dichroism coloring matter. the content of the dichromatic dye in this water solution -- usually -- per [0.001] water 100 weight section - 0.1 weight sections extent -- it is below the 0.01 weight section advantageously. This water solution may contain the mineral salt of a sodium sulfate etc. The temperature of this water solution is usually about

20-80 degrees C, and immersion time amount is usually about 30 - 300 seconds.

[0013] Boric-acid processing is performed by immersing the uniaxial-stretching polyvinyl-alcohol-resin film dyed for example, with dichroism coloring matter in a boric-acid water solution. the content of the boric acid in a boric-acid water solution -- usually -- per [2] water 100 weight section - 15 weight sections extent -- it is 5 - 12 weight section extent preferably. The temperature of a boric-acid water solution is 50 degrees C or more, and is usually 50-85 degrees C preferably. Immersion time amount is about 100 - 1,200 seconds usually about 200 - 400 seconds still more preferably about 150 to 600 seconds preferably. When dichroism coloring matter is iodine, the boric-acid water solution may contain potassium iodide. the case where a boric-acid water solution contains potassium iodide -- the amount -- usually -- per [0.1] water 100 weight section - 20 weight sections extent -- desirable -- 2 - 18 weight section extent -- it is 5 - 15 weight section extent still more preferably.

[0014] Uniaxial stretching may be performed before dyeing, may be performed to dyeing and coincidence, and may be performed after dyeing. When carrying out after dyeing uniaxial stretching, this uniaxial stretching may be performed before boric-acid processing, and may be performed during boric-acid processing. Moreover, it is also possible to perform uniaxial stretching in two or more phases of course among these.

[0015] Rinsing processing of the polyvinyl-alcohol-resin film after boric-acid processing is usually carried out. Rinsing processing is performed by, for example, immersing the polyvinyl-alcohol-resin film by which boric-acid processing was carried out in water. In rinsing processing, the temperature of water is usually about 5-40 degrees C, and immersion time amount is usually about 2 - 120 seconds. Subsequently, although desiccation processing is performed, 100 degrees C or less of drying temperature are usually 40-95 degrees C preferably. The time amount of desiccation processing is usually about 120 - 600 seconds.

[0016] Like the usual case, the polarization film obtained in this way carries out the laminating of the protection film to the one side or both sides, and let it be a polarizing plate. As a protection film, for example, an annular polyolefin resin film like a cellulose acetate resin film like triacetyl cellulose or diacetyl cellulose, an acrylic resin film, a polyester resin film, a polyarylate resin film, a polyether sulphone resin film, and a poly norbornene resin film etc. is mentioned, and the thickness is usually 30-200 micrometers. It is extent. Isotropic adhesives are usually used for a laminating transparently and optically, and the adhesives of a polyvinyl alcohol system are used as these adhesives, for example.

[0017] The polarizing plate obtained in this way may have the rebound ace court layer, the acid-resisting layer, the anti-glare layer, etc. on the front face. Moreover, the binder is usually applied at least to one side of the above-mentioned polarizing plate.

[0018] Each absorbance A, B, C, D, and E in the wavelength of 450nm, 500nm, 550nm, 600nm, and 650nm makes the layer which has the absorption spectrum which fills all the relation between said formula (I) - (IV) exist in this invention. The place which a formula (I) - (IV) mean has the ratio of each absorbance A, B, C, and E in the wavelength of 450nm to the absorbance D in the wavelength of 600nm, 500nm, 550nm, and 650nm, i.e., a relative absorbance, in having made it satisfy specific relation, when the absorption spectrum of the layer concerned is measured. In order to consider as the layer which has such a specific absorption spectrum, coloring using coloring agents, such as a color and a pigment, is usually appropriate.

[0019] It is more desirable not to have dichroism, although the color or pigment used may have dichroism in order to consider as this coloring layer. On the other hand, when using the color or pigment which has dichroism, it is important that it is not made to carry out orientation of a color or the pigment to altitude in a coloring layer. Moreover, in order to fill the relation between a formula (I) - (IV), you may choose suitably, and two or more kinds of colors or pigments may be mixed, and one kind of color or a pigment may be used.

[0020] what is classified into a disperse dye, acid dye, or direct dye as a color, for example -- more -- concrete -- Color Index (Colour Index) Disperse and Acid or -- Direct The color classified is suitable. In order to make it fill the relation between the formula (I) specified by this invention - (IV), especially a purple color is suitable. If a suitable color is illustrated by the trade name (inside of a parenthesis)

corresponding to a Color Index generic name (Colour Index generic name) and it, the following is mentioned and the thing of each trade name is sold from Sumitomo Chemical Co., Ltd.

[0021] C.I.Disperse Violet 26 ("Sumikaron Bordeaux SE-BL"), C.I.Disperse Violet 28 ("Sumikaron Violet E-2RL"), C.I.Disperse Violet 57 ("Sumikaron Brilliant Violet SE-BL"), C.I.Disperse Violet 77 ("Sumikaron Violet S-4RL extra conc."), C.I.Acid Violet 48 ("Suminol Milling Brilliant Violet B conc."), C.I.Direct Violet 9 ("Nippon Brilliant Violet BK conc.") etc.

[0022] Also in these, it is C.I.Direct Violet 9. It is used preferably. Of course, the color of other colors can also be blended and used for these purple colors if needed. Moreover, the color used by this invention chooses a color or a pigment suitably, and depending on the case, various combination of it can be carried out and it can use it so that it may not necessarily be limited to these and an absorption spectrum may fill the relation between a formula (I) - (IV).

[0023] It is made to specifically exist in this invention, in one side of the glue line and polarization film which are used in order to paste a protection film and a polarization film together among one side of a protection film or both sides, and a protection film or both sides, a polarization film, or one layer of the binder layers that what is necessary is just to make the coloring layer containing a color or a pigment exist in the layer of the arbitration of a polarizing plate so that the relation between a formula (I) - (IV) may be filled. Moreover, although a coloured film is pasted together to a polarizing plate and the neutral gray polarizing plate of this invention can be produced also as a polarizing plate with a coloured film for example, it cannot be said from the reasons of that the polarizing plate itself becomes thick, cost going up that this approach is not much suitable.

[0024] In order to prepare a coloring layer in one side or both sides of a protection film, the approach of air-drying, after applying to homogeneity the solution which dissolved water soluble dye in the polyvinyl alcohol water solution on a protection film, the approach of applying on a protection film and stiffening, after making an acrylic rebound ace court agent dissolve or distribute a color or a pigment, etc. are employable. What is necessary is for the approach usually used, for example, dipping, the coating using various coating machines, etc. just to perform spreading. Moreover, a color or a pigment may be vapor-deposited on a protection film.

[0025] After making the raw material dope before producing a protection film dissolve or distribute a color or a pigment in order to use a protection film as a coloring layer for example, the approach of producing a film, the method of dyeing a protection film, etc. are employable. In order to use the glue line for pasting a protection film and a polarization film together as a coloring layer, a color or a pigment is dissolved or distributed in the adhesives before hardening, it is used like the usual adhesives, and the approach of sticking a protection film and a polarization film etc. is used. In addition, it will be easily understood that coloring adhesives may be used for either and you may use it for both, when preparing a protection film in both sides of a polarization film. In order to use the front face or the interior of a polarization film as a coloring layer, vacuum deposition, a staining technique, a coating method, etc. are employable. In order to use a binder layer as a coloring layer, the method of making a binder raw material dissolve or distribute a color or a pigment etc. is used. In this invention, a coloring layer may exist in which location of a polarizing plate, and there ***** this one coloring layer and two or more layers may be coloring layers.

[0026] The amount of a color or a pigment is determined from the permeability of a polarizing plate. In a 400-700nm wavelength field, permeability here is predetermined wavelength spacing λ , for example, is the value T which asks for spectral transmittance $\tau(\lambda)$ and is computed by the bottom type (V) at intervals of 10nm.

$$T = \frac{\int_{400}^{700} P(\lambda) \cdot y(\lambda) \cdot \tau(\lambda) \cdot d\lambda}{\int_{400}^{700} P(\lambda) \cdot y(\lambda) \cdot d\lambda} \quad (V)$$

[0028] Among a formula, P(λ) expresses the spectral distribution of standard light (illuminant C),

and $y(\lambda)$ expresses a visual field color matching function twice.

[0029] And it is the simple substance permeability T_y about the permeability calculated from the spectral transmittance of one polarizing plate. It is permeability T_p that it is only parallel in the permeability calculated from the spectral transmittance when piling up a call and two polarizing plates so that each absorption shaft may become the same. At least a rectangular cross is permeability T_c about the permeability calculated from the spectral transmittance when piling up a call and two polarizing plates so that each absorption shaft may intersect perpendicularly. It calls.

[0030] Simple substance permeability T_y of the polarizing plate called for by doing in this way in this invention It is made to become 40% or more. If there are not much many amounts of the color which exists in a coloring layer, or a pigment, it is the simple substance permeability T_y of a polarizing plate. It becomes small too much and white brightness falls. Moreover, except setting to T_1 (%) the simple substance permeability of the polarizing plate which has a coloring layer, and a coloring agent not being included, when the simple substance permeability of the polarizing plate completely considered as the same configuration is set to T_0 (%), it is a bottom type (VI).

[0031] $K = T_0 - T_1$ (VI)

[0032] It is desirable to make a color or a pigment contain so that K value which is alike and is calculated more may become 0.05 to about 3, and further 0.1 to about 2.5. If K value is not much small, the target hue cannot be acquired, and on the other hand, if K value is not much large, the permeability of a polarizing plate will fall, and the white brightness when using it for a liquid crystal display falls.

[0033] degree of polarization P_y about [parallel] -- permeability T_p and -- about a rectangular cross -- permeability T_c from -- although it asks by the bottom type (VII), as for the polarizing plate of this invention, it is desirable that this degree of polarization is 99% or more.

[0034]

$$P_y = \sqrt{\frac{T_p - T_c}{T_p + T_c}} \times 100 \quad (\%) \quad (\text{VII})$$

[0035] At this invention, it is about a polarizing plate again. a^* and b^* of a rectangular hue which are measured by JIS Z 8729 (a color specification approach - $L^*a^*b^*$ color coordinate system and $L^*u^*v^*$ color coordinate system) respectively - $5.0 \leq a^* \leq 10$ It reaches. It becomes the range of $-10 \leq b^* \leq 1.0$ and, similarly a^* and b^* of an parallel hue are $-4.0 \leq a^* \leq 4.0$ respectively. It reaches. It is made to become the range of $-1.0 \leq b^* \leq 5.5$.

[0036] A rectangular hue here means being measured, where two polarizing plates are piled up so that each absorption shaft may intersect perpendicularly, and an parallel hue means being measured, where two polarizing plates are piled up so that each absorption shaft may become the same. In a $L^*a^*b^*$ color coordinate system, a hue serves as neutral gray, so that a^* and b^* are close to zero respectively. In addition, JIS Z 8729 The method of presentation of the object color to define is the Commission Internationale de l'Eclairage (Commission Internationale de l'Eclairage, abbreviated-name CIE) issue. Publication CIE No.15.2 (1986), COLORIMETRY, and SECOND EDITION It is equivalent to the method of presentation of the object color set to 4.

[0037]

[Example] Hereafter, although an example explains this invention to a detail further, this invention is not limited at all by these examples.

[0038] In the following examples, evaluation of a polarizing plate was performed as follows. first, about the time of piling up so that an absorption shaft may intersect perpendicularly when two polarizing plates are piled up about one polarizing plate so that each absorption shaft may become the same and A spectrophotometer ("UV-2200" by Shimadzu Corp.) is used, and it is 400-700nm. It asks for spectral transmittance $\tau(\lambda)$ at intervals of 10nm in a wavelength field, and it is permeability T_p that it T (ies) [simple-substance-permeability-] and is only parallel by said formula (V) from there. And rectangular grade permeability T_c It computed. and -- about [parallel] -- permeability T_p and -- about a rectangular cross -- permeability T_c from -- said formula (VII) Degree of polarization P_y It asked. It measured based on a hue and JIS Z 8729, and the value was displayed by the $L^*a^*b^*$ chromaticity

coordinate. In a $L^*a^*b^*$ color coordinate system, a hue serves as neutral gray, so that a^* and b^* are close to zero.

[0039] The following were prepared as the example dyeing bath of contrast, and a boric-acid water solution.

[0040] dyeing bath: per water 100 weight section and iodine -- the 0.05 weight section and potassium iodide -- 5 weight sections -- water solution each contained.

boric-acid water solution: per water 100 weight section and a boric acid -- the 7.5 weight sections and potassium iodide -- 6 weight sections -- water solution each contained.

[0041] Thickness of 75 micrometers It was immersed in the above-mentioned dyeing bath with a temperature of 28 degrees C for 60 seconds, carrying out uniaxial stretching of 99.9% or more of the polyvinyl alcohol film to 5 times as many draw magnification as this by dry type a degree of polymerization 2,400 and whenever [saponification], and maintaining turgescence. Subsequently, it was immersed in the above-mentioned boric-acid water solution with a temperature of 73 degrees C for 300 seconds, with turgescence maintained. Then, 15-degree C pure water washed for 10 seconds. Maintaining the film after rinsing at turgescence, it dried for 300 seconds at 70 degrees C, and the polarization film was obtained.

[0042] On the other hand, 5% water solution of full saponification polyvinyl alcohol was used as adhesives. These adhesives were applied to both sides of the polarization film obtained in the top, and subsequently, the protection film ("FUJITAKKU UV80" by Fuji Photo Film, Inc.) whose front face is the thickness of 80 micrometers by which saponification processing was carried out in the product made from triacetyl cellulose was pasted together to each field where these adhesives were applied, and it dried for 5 minutes at 50 degrees C to it, and considered as the polarizing plate in it. About this polarizing plate, L^* [of the simple substance permeability T_y , degree of polarization P_y , and an parallel hue], a^* , and b^* list was asked for L^* , a^* , and b^* of a rectangular hue, and that result was shown in Table 1.

[0043] Color "Suminol Milling Brilliant Violet B conc."120mg by Sumitomo Chemical Co., Ltd. was dissolved in 20g of 5% water solutions of example 1 full saponification polyvinyl alcohol, and it considered as adhesives. Except using these adhesives, the same trial as the example of contrast was performed, and that result was shown in Table 1. Moreover, from the simple substance permeability of the polarizing plate obtained here, and the simple substance permeability of a polarizing plate without the coloring layer obtained in the example of contrast, K value was calculated by said formula (VI), the result was also combined, and it was shown in Table 1.

[0044] Furthermore, it is about 5 micrometers of thickness, using as dope liquid the adhesives used here. The film was produced and the absorption spectrum of a coloring layer was measured. It asked for the ratio to the absorbance D in the wavelength of 600nm of the absorbance A in the wavelength of 450nm, the absorbance B in the wavelength of 500nm, the absorbance C in the wavelength of 550nm, and the absorbance E in the wavelength of 650nm, respectively, and the result of Table 2 was obtained from the obtained absorption spectrum.

[0045] Color "Nippon Brilliant Violet BK conc."40mg by Sumitomo Chemical Co., Ltd. which is different in an example 1 was dissolved in 20g of 5% water solutions of example 2 full saponification polyvinyl alcohol, and the same trial as an example 1 was performed except having made this into adhesives. The result was shown in Table 1 and 2.

[0046] Color "Sumifix Brilliant Blue R" 60mg by Sumitomo Chemical Co., Ltd. which is different in an example 1 in 20g of 5% water solutions of example of comparison 1 full saponification polyvinyl alcohol It was made to dissolve and the same trial as an example 1 was performed except having made this into adhesives. The result was shown in Table 1 and 2.

[0047] The 60mg of the same colors as an example 2 was dissolved in 20g of full 25% saponification polyvinyl alcohol water solutions of examples of a comparison, and the same trial as an example 2 was performed except having made this into adhesives. The result was shown in Table 1. In addition, since the relative absorbance in each wavelength of the film obtained from these adhesives was almost the same as that of an example 2, the publication to Table 2 was omitted.

[0048]

[Table 1]

The optical property of a polarizing plate ----- Example No. Ty K value Py
 Taira Line Color Phase Direct Intersection Color Phase (%) - (%) L* a* b* L* a* b* -----
 ----- Example of contrast 42.72 - 99.98 66.90 -1.59 6.65 0.05 0.09 0.04 -----
 -- Example 1 40.28 2.44 99.97 63.72 -0.03 1.88 0.08 0.14 -0.03 example 2 40.06 2.66 100 63.43 0.69
 3.59 0.01 0.12 -0.05 ----- Example 1 of a comparison 41.56 1.16 100 65.39 -
 2.05 5.63 0.01 0.15 Example 2 of -0.09 comparison 39.13 3.59 100 62.21 1.88 1.45 0.01 0.07 -0.01 -----
 ----- [0049]

[Table 2]

染料含有接着剤層の相対吸光度

	A/D	B/D	C/D	E/D
実施例 1	0.09	0.29	0.80	0.09
実施例 2	0.18	0.65	1.35	0.07
比較例 1	0.11	0.28	0.64	0.76
本発明の規定	0~0.3	0.1~0.7	0.5~1.4	0~0.5

[0050] (Footnote of Table 2)

A: The absorbance in the wavelength of 450nm, the absorbance in B:wavelength of 500nm, the absorbance in C:wavelength of 550nm, the absorbance in D:wavelength of 600nm, E : the absorbance in the wavelength of 650nm.

[0051] Compared with the polarizing plate of the example of contrast in which, as for the polarizing plate which the coloring layer used in the examples 1 and 2 had satisfied all the relation between said formula (I) - (IV), and made this the glue line, the absorption spectrum does not have a coloring layer, the parallel hue serves as neutral gray more so that the above example may show. On the other hand, compared with the polarizing plate of the example of contrast without a coloring layer, the polarizing plate which the coloring layer used in the example 1 of a comparison did not satisfy the relation of a formula (IV) although the absorption spectrum satisfied the relation between a formula (I) - (III), but made this the glue line had a small change of an parallel hue, and it was far from neutral gray. On the other hand, when a color is made [many] like the example 2 of a comparison, simple substance permeability will be less than 40%, and will give a white indication of a liquid crystal display dark.

[0052]

[Effect of the Invention] The polarizing plate of this invention has the rectangular hue of high degree of polarization and neutral gray which was the advantage of a polarizing plate in which an parallel hue approached neutral gray and did not have a coloring layer. Therefore, if this polarizing plate is applied to a liquid crystal display, there is no coloring of a white display, by high contrast, a black display will also be neutral gray and good visibility will be acquired.

[Translation done.]

US-PAT-NO: 4842781

DOCUMENT-IDENTIFIER: US 4842781 A

TITLE: Colored polarizing film and method of making same

----- KWIC -----

Brief Summary Text - BSTX (38):

Using a Henschel mixer or a blender, one or more resinous polymers in the form of pellets, chips or powder are mixed with one or more dichroic dyes and this mixture is kneaded until it becomes homogeneous. During this step, additional components such as dispersants, stabilizers, ultraviolet light absorbers and the like may be added thereto. Alternatively, the surfaces of a resinous polymer base material can be dyed by soaking the resinous polymer (in the form of pellets, powder or the like), for example, in an aqueous dispersion of one or more dyes with vigorous stirring. The amount of the dye or dyes to be blended may be suitably determined so as to provide the color and contrast ultimately desired in the resulting polarizing film.